"We have to know what we have, how and why it is changing, what changes we can accommodate, and which we must combat."

Fran Mainella, Science and Learning Center Dedication, Crater Lake, 22 August 2002

Assessing and Managing Threats

NPS PHOTO

Etched into a saguaro cactus, the Mexican state name "Sinaloa" betrays the path of illegal aliens and drug smugglers entering the United States at Organ Pipe Cactus National Monument. Stepped-up efforts to shut down these activities at populated areas along the U.S.-Mexico border have led to an alarming increase in crossing attempts in remote areas like Organ Pipe.

A large part of the stewardship of the national parks is the assessment and management of influences and activities that are or could be damaging to park resources. This essential duty entails anticipating and detecting resource degradation and taking action to maintain resource quality. It involves attentiveness, rational planning, and diligent, hands-on intervention based in science. And it requires weighing a wide range of needs and potential responses. This year's articles highlight the astonishing variety of challenges and the search for fair and effective management solutions. They tell of monitoring resource impacts from illegal border crossings, containing an oil well blowout, the worrying spread of infectious wildlife diseases, negotiating water resource protection in the desert Southwest, restoring an island ecosystem infested with nonnative rats, determining legal limits for noise pollution, and other issues. In each case the National Park Service is striving to provide opportunities for people to continue to enjoy unimpaired park resources.

Monitoring border resource impacts in Organ Pipe Cactus National Monument

by Ami Pate

MAPPING FOOTPRINTS, WATER JUGS, AND SALSA cans is an unusual new task for biologists in the Sonoran Desert borderlands of Arizona. After years of observing increasing resource impacts caused by migrants and smugglers, Organ Pipe Cactus National Monument developed a formal monitoring protocol to quantify the problem in 2002.

"This unprecedented flow of illegal traffic and the subsequent increase in law enforcement activities have had devastating impacts on wilderness resources."

Until the mid-1990s, Organ Pipe's 30-mile southern boundary was considered a tranquil stretch of the international border. Resource damage was light and sporadic, even though most of the monument's boundary land is accessible from Mexico by dirt roads or paved highway, with only a four-strand barbed-wire fence between the two countries to exclude livestock. Some vandalism of historic structures and wood cutting occurred close to the border, a few migrant trails were used seasonally, and drug smugglers were occasionally apprehended. Only a few Border Patrol agents and park rangers patrolled the area.

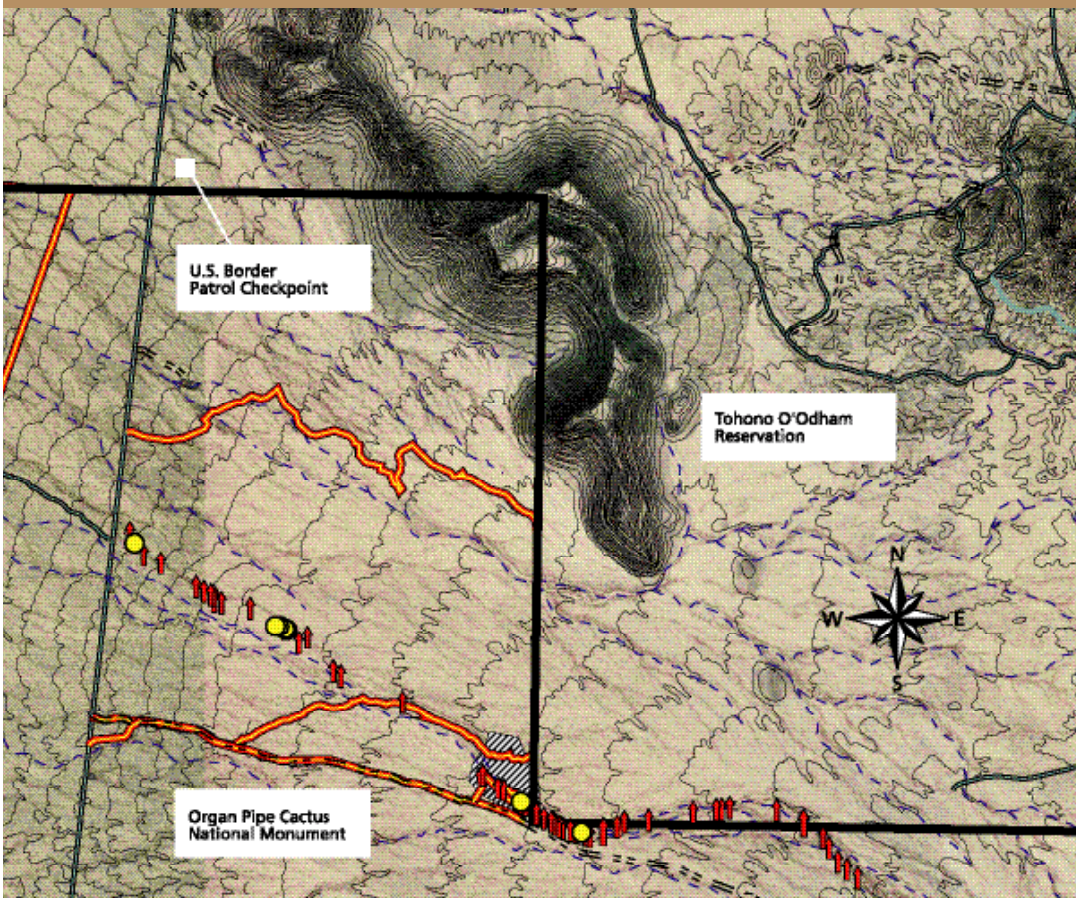
From 1993 to 1995 the Border Patrol launched a series of enforcement operations in El Paso, San Diego, and Nogales that effectively rerouted border crossers to remote southwestern desert lands, including the designated wilderness of Organ Pipe Cactus National Monument. In 2001 an estimated 200,000 people entered the monument from Mexico. In the same year, Organ Pipe law enforcement rangers seized 14,700 pounds of marijuana, more than in all other units of the National Park System combined. Park managers estimate that "unofficial" wilderness use exceeds permitted use by at least a hundredfold.

This unprecedented flow of illegal traffic and the subsequent increase in law enforcement activities have had devastating impacts on wilderness resources. Foot trails, discarded bottles, cans, and clothing are commonly found throughout the monument. Rest areas or "bivouac sites" are denuded of brush and cactus seedlings. Several highly used migrant and smuggler trails intersect important water holes and cultural resources. Habitats for endangered species such as Sonoran pronghorn and ferruginous pygmy owls are under siege. Off-road vehicle tracks, abandoned vehicles in fragile desert terrain, and graffiti on rocks and cacti are other examples of ongoing wilderness degradation that create a

NPS PHOTO

Scientific monitoring was expanded in 2002 and revealed a staggering amount of resource disturbance from illegal foot traffic and extensive off-road driving, including abandoned vehicles, trash, fire pits, and rest sites.

ILLEGAL IMMIGRATION ROUTES AND FERRUGINOUS PYGMY OWL BREEDING TERRITORY, ORGAN PIPE CACTUS NATIONAL MONUMENT



NPS MAP BY BRIAN BARNS, ADAPTED BY NATURAL RESOURCE INFORMATION DIVISION

Human competition for water sources used by wildlife such as the endangered Sonoran pronghorn is a concern of park managers, as are footpaths that cross breeding territory of the endangered ferruginous pygmy owl.

"Park managers estimate that 'unofficial' wilderness use exceeds permitted use by at least a hundredfold."

need for daily foot, vehicle, and aerial patrols by a variety of law enforcement agencies.

With funding from the National Park Service's Mexican Affairs Office in spring 2002, Ecological Monitoring Program coordinator Bryan Milstead and cartographic technician Brian Barns designed a monitoring program to assess the extent of these border impacts. They established five east-west belt transects in the four geographic corners and center of the monument. One well-traveled, north-south migrant trail was also surveyed. A total of 100 kilometers (62 miles) was walked from January to March. All human disturbances encountered within 20 meters of the transect center line were mapped with a geographic positioning systems unit and described. When possible, resource managers walked the transects with law enforcement rangers, who contributed valuable professional experience in detecting the presence of human activity.

Data from this monitoring project are being used in GIS models and in educational presentations for interagency managers, scientists, and the public. In November 2002, resource management staff began the second round of transect data collection. Monitoring will be conducted semiannually to assess trends and patterns of backcountry impacts to assist managers in formulating strategies for protecting the monument's resources in the future. ■

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Oil well blowout at Obed Wild and Scenic River

by Pat O'Dell and Rick Dawson

"The crew was unable to prevent the stream of oil from … cascading down the cliffs into the creeks of Obed Wild and Scenic River."

ON THE AFTERNOON OF FRIDAY, 18 JULY 2002 in Morgan County, Tennessee, oil and gas drillers labored on a bluff high above the confluence of Clear and White Creeks of the Obed Wild and Scenic River. The crew was ill-prepared for what they would find: a high-pressure, high-flow-rate oil zone. Oil surged into the well from 2,500 feet below the surface, quickly filling a pit at ground level. With no equipment for closing the well, the crew's grip on the situation was tenuous at best. Within hours, oil and gas poured from the well while workers scrambled to contain the worst of the mounting spill volume with vacuum trucks and hurriedly built pits and dikes. The crew was unable to prevent the stream of oil from seeping into the ground, breaching dikes, and cascading down the cliffs into the creeks of Obed Wild and Scenic River. On Saturday morning, a single spark became a huge fireball that ate its way through volatile vapors rising from the oiled waters, leaving pools and trails of burning oil in its wake.

By Saturday afternoon, the response to this event was in full swing as local, state, and federal emergency workers converged on the site. Firefighters suppressed the incidental fires, and specialized oil well firefighters mobilized from Texas to squelch the well fire. Park staff joined in the battle by providing operational assistance and important natural resource information to incident command. Once the fire ended, an NPS petroleum engineer with the Geologic Resources Division was called in to assess remaining threats to park resources posed by the oil well. Also, a team of experts from the National Park Service, the State of Tennessee, and the U.S. Fish and Wildlife Service directed a natural resource damage assessment. Under the Oil Pollution Act, the company responsible for the spill is liable for all oil removal costs and damage caused by the spill, including compensation for affected natural resources. The measure of natural resource damage is the cost of restoring, rehabilitating, replacing, or acquiring the equivalent of the damaged natural resources, the loss in value of the resource pending restoration, plus the reasonable cost of assessing those damages.

NPS PHOTO

A fiery oil well blowout rages on a bluff above Obed Wild and Scenic River, dumping petroleum into Clear Creek in the national park. Scorched trees along the bank and pockets of burning oil are remnants of the fireball that roared through the valley hours earlier.

Response and damage assessment are critical elements of a common challenge: balancing the rights and needs of extractive mining and petroleum industries while ensuring protection of parks' valued resources. The National Park Service is becoming more proficient at incident response and the process of damage assessment—good news for parks like Obed and Big South Fork, which are situated in Tennessee's most prolific mineral production areas. The most important task is making the industry and its regulators aware of the locations and values of important natural resources like those found in the Obed Wild and Scenic River. Once these resources are brought to their attention, oil and gas developers generally begin taking the necessary steps to protect them.

Renewed interest in prevention nearly always follows an accident of this size, and rightly so. Within days the State of Tennessee directed operators to use blowout prevention equipment and is now in the process of reviewing its entire oil and gas program to avoid a repeat disaster. The National Park Service will participate in that review process to ensure that park resources are protected. This action comes just in time, as news of the gusher has excited the oil and gas community and new wells are already being drilled in drainages near the park. The balancing act continues. ■

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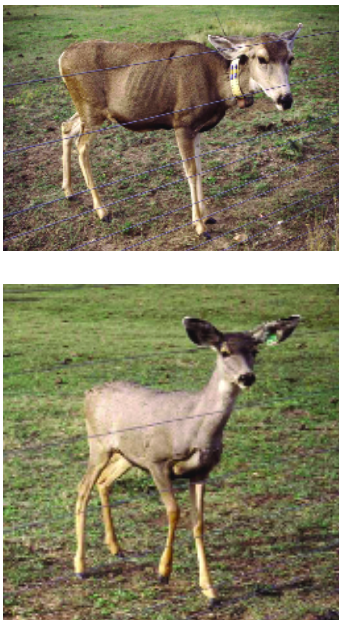
Chronic wasting disease: An emerging infectious disease of concern

by Margaret A. Wild



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A fatal brain malady of unknown origin, chronic wasting disease has been documented in free-ranging elk and deer in several western and midwestern states. Sick animals (top, compare with healthy deer, bottom) are thin, lose their fear of humans, and develop a blank stare; additional signs of illness may include drooping ears; excessive salivation, drinking, and urination; and eventually tremors and incoordination.

"WEST NILE VIRUS APPEARS THROUGHOUT United States." "Amphibians decline due to Chytrid fungus." "Chronic wasting disease threatens deer and elk." Conservationists, hunters, public health officials, and the general public take note of such headlines because these emerging infectious diseases pose a threat to natural resources in various areas of the country, including national parks.

Chronic wasting disease is not a new discovery, but the attention focused on it in recent years is unprecedented in wildlife health management. The disease first appeared in Wyoming and Colorado, including Rocky Mountain National Park, more than 20 years ago. Although the origin of the disease is unknown, it is believed to be an exotic disease process that is the result of human intervention. Concern about chronic wasting disease increased with the recent detection of it in several new locations. Since 1997, chronic wasting disease has been found in 25 elk and deer farms throughout the United States and in free-ranging deer in Nebraska, South Dakota, Wisconsin, Illinois, and New Mexico. Increased surveillance will likely lead to identification of additional areas of infection in coming years.

Chronic wasting disease belongs to the family of fatal brain diseases known as transmissible spongiform encephalopathies. Related diseases include scrapie of sheep, bovine spongiform encephalopathy (mad cow disease), and human Creutzfeldt-Jakob disease. These diseases are not caused by viral or bacterial infections, but scientists have noted accumulations of abnormal prion proteins in the brains of affected animals.

NPS PHOTO BY DAN RODDY

Rocky Mountain National Park uses tonsillar biopsy of anesthetized deer to identify chronic wasting disease before symptoms appear.

Because of the unique nature of the disease agent, scientists have had to determine new methods for detection, diagnosis, and possible treatments.

Diagnosis of chronic wasting disease has traditionally been made using brain samples collected postmortem from deer and elk. New developments have led to a live animal test for deer using tonsillar biopsies obtained from anesthetized deer. Unfortunately this technique is not currently applicable to elk because of differences in the accumulation of prion protein in the tonsils of elk and deer. While this intensive testing approach is not practical for all management situations, it is being applied in Colorado's Rocky Mountain National Park and South Dakota's Wind Cave National Park, where chronic wasting disease is a significant threat to resources.

At other national parks, managers are encouraged to be on the lookout for the disease. It should be suspected in deer and elk more than 17 months old that are thin and exhibit behavioral abnormalities, such as loss of fear of humans. Additional clinical signs include a blank stare, drooping ears, excessive salivation, excessive drinking and urination, and, terminally, tremors or incoordination. Targeted surveillance, in which any deer or elk with clinical signs similar to those of chronic wasting disease are collected for diagnostic testing, is an effective and easily applied management technique.

Much remains to be learned about chronic wasting disease. The specific route and mechanism of disease transmission have not been identified, but are believed to be from animal to animal or contaminated environment to animal via saliva or feces. Although investigations have found no evidence that the disease occurs naturally in species other than deer and elk, the agricultural community and public remain concerned that domestic livestock or humans could become infected. Yet the disease itself and management actions to control it present a real threat to populations of deer and, to a lesser extent, elk. For these reasons chronic wasting disease will likely remain in the headlines and on the minds of conservationists for years to come. ■

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Recent decisions protect resources at Lake Mead

by Dan McGlothlin

NEGOTIATED SETTLEMENTS IN 2001 AND 2002 involving the National Park Service, Bureau of Land Management, and U.S. Fish and Wildlife Service resulted in agreements with water developers in the watersheds of the Virgin and Muddy Rivers to protect resources administered by the Department of the Interior from impacts attributed to pumping groundwater. These agreements are supported by a series of decisions made by the Nevada State Engineer.*

"The effect of extensive groundwater pumping on stream flows, spring flows, and associated plants and animals is unknown."

NPS PHOTO

Springs and streams at Lake Mead National Recreation Area diversify the desert landscape, supplying scarce water to wildlife and vegetation. Some of these water resources are fed by aquifers extending far beyond park boundaries, and may be vulnerable to groundwater pumping to meet growing human needs in the Las Vegas area.

The watersheds in question include a large area of eastern and southeastern Nevada, which drains generally southward toward the Colorado River at Lake Mead. Groundwater flows among the area's 29 hydrographic basins through a system of aquifers. This system has been termed "The Colorado Regional Ground-Water Flow System of Nevada" or simply the "Colorado System" by the United States Geological Survey (USGS).

Many water resources associated with the Colorado System can be seen at Lake Mead National Recreation Area (Nevada), including tributary streams that flow into the lake, and springs that discharge on lands adjacent to the shores of the lake. The Virgin and Muddy Rivers flow through the park into the lake's Overton Arm. Eight named springs and additional seeps occur on lands on the west side of the Overton Arm, including the large-volume, warm-water Rogers and Blue Point Springs.

Since 1989, applications for groundwater rights in desert basins near the park increased beyond previously determined rates of sustainable yield. The effect of extensive groundwater pumping on stream flows, spring flows, and associated plants and animals is unknown. In response to this uncertainty, the National Park Service is participating in the Nevada water rights permit process to ensure that park water rights are fully considered in water allocation decisions. The National Park Service is also assisting the state engineer by gathering scientific information to improve understanding of impacts from pumping.

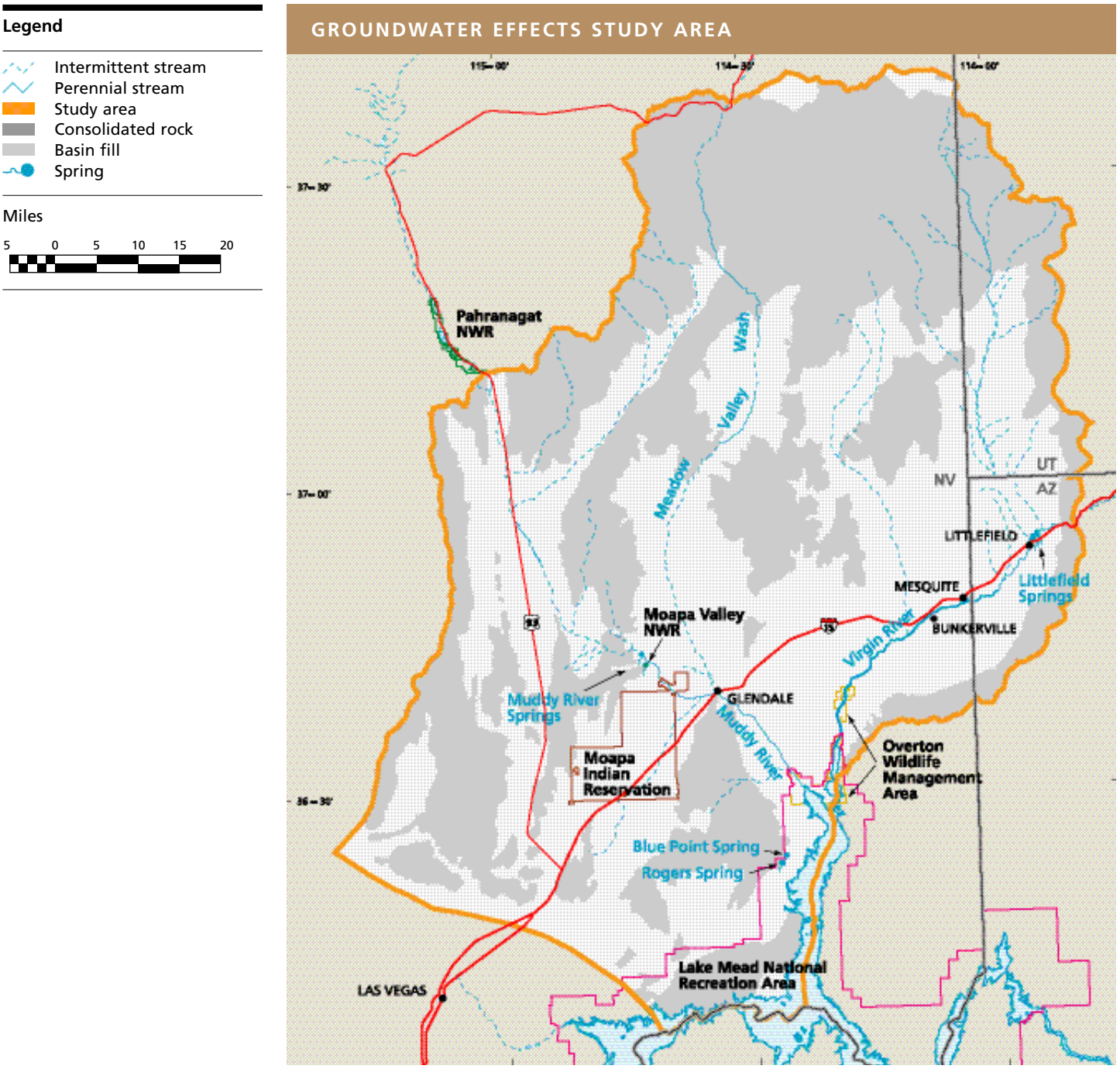
*State Engineer's Ruling Nos. 5008, 5115, 5167, and 5181 and State Engineer's Order No. 1169.

Why is the National Park Service concerned about groundwater far from the park boundary? Groundwater withdrawals have the capacity to intercept the sources of rivers and springs that flow into Lake Mead National Recreation Area. However, without adequate scientific information, it is difficult to understand the sustainability of large groundwater withdrawals from the Colorado System and the effects that groundwater development will have on park resources. Because the state engineer allocates water basin by basin, approved developments could change the direction and magnitude of interbasin flow, disrupting the discharge of groundwater to streams and springs.

To address this problem the National Park Service and the U.S. Fish and Wildlife Service are developing a three-dimensional groundwater flow model. Intended for use in estimating the potential effects of groundwater pumping in southern basins of the lower Colorado System on the resources of the Moapa National Wildlife Refuge and Lake Mead National Recreation Area, the model encompasses an area of approximately 300 square miles across 10 hydrographic basins. Model development, begun in 2001, is aided by ongoing cooperative studies with the USGS and Southern Nevada Water Authority to investigate the system's complex hydrogeologic framework, improve water budget estimates, and incorporate groundwater pumping data.

Until sufficient information can be gathered regarding the long-term implications of groundwater removal, the state engineer has carved out a conservative middle ground to address both water resource protection and the possible development of additional groundwater. The state engineer, in several decisions issued in 2001 and 2002, concluded that "only by gradual, staged development can the additional science be obtained which will allow a better understanding of the … aquifer(s) and the effect new appropriations will have on interbasin flows and the direction of groundwater movement." The agreements between the National Park Service and the water developers implement this strategy through monitoring, management, and mitigation provisions.

Limiting additional development and encouraging early detection of impacts further the understanding of the hydrogeologic complexity of the lower Colorado System and aquifer responses to pumping. This information will be



The National Park Service, U.S. Fish and Wildlife Service, and water developers near Las Vegas, Nevada, are studying a 300-square-mile area to gain a better understanding of the effects of groundwater pumping on water resources in Lake Mead National Recreation Area and Moapa National Wildlife Refuge.

used to refine the groundwater flow model, giving the National Park Service and other Department of the Interior bureaus the opportunity to create a very powerful tool for estimating the effects of any existing or proposed groundwater withdrawals from the system. It also can be used to illustrate the time it will take for water levels to recover after pumping ceases. This tool and the results that can be generated with it are proving very useful. To date, the model has been used in negotiating settlement of protests, in constraining adaptive groundwater management options, and as evidence in an administrative hearing before the state engineer. It also demonstrates the National Park Service's commitment to cooperate, consult, and coordinate science-based decision making to ensure protection of park water rights and resources. ■

Map—Geology modified from Plume and Carlton (1988). Base modified from USGS digital data, 1:100,000 and USGS GAP Analysis data.

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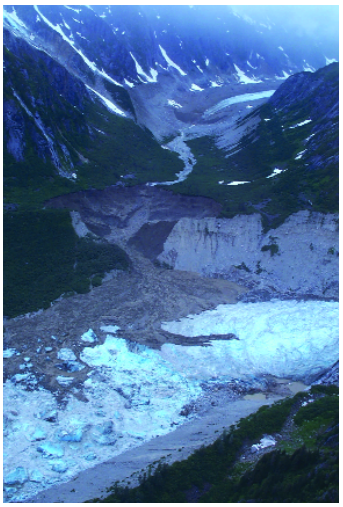
Bank stabilization studied at Klondike Gold Rush

by Meg Hahr and Theresa Thibault



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A moraine in the Taiya River watershed in Klondike Gold Rush National Historical Park released 10 million cubic yards of debris in July 2002, suddenly filling a glacial lake. The resulting flood threatened visitors, historic structures, and park facilities in the gold rush town of Dyea.

SINCE ITS INCEPTION, KLONDIKE GOLD RUSH National Historical Park (Alaska) has been faced with a particularly complex natural resource management issue regarding important cultural resources and a highly dynamic river. Established in 1976 to preserve historic structures and trails associated with the Klondike Gold Rush of 1898, the park also contains significant natural resources including salmon, bald eagles, grizzly bears, glaciers, and a productive estuary. Another valued park resource is the Taiya River, a free-flowing, glacial meltwater river affected by coastal, stream, and tectonic processes. This extremely dynamic river drains approximately 188 square miles of glaciers and coniferous forest and is prone to spontaneous channel migrations and catastrophic flooding.

The river's unpredictable nature was highlighted on 23 July 2002, when a landslide of 10 million cubic yards of moraine material suddenly filled a glacial lake in a tributary drainage, generating a tremendous flood that swept through the park, threatening visitors, cultural resources, and park facilities. Over the last century, the Taiya River has wandered widely over its floodplain, causing the removal of more than 30% of the historic gold rush town of Dyea, part of a National Historic Landmark District. To date, a total of 345 archeological features have been found in Dyea along with an uncounted number of historic artifacts.

In its 1996 general management plan, the park resolved to evaluate the Taiya River erosion issue and find a way to prevent additional loss of cultural resources in the Dyea area. Although stream bank stabilization projects are permitted under *NPS Management Policies* for situations in which "there is no other feasible way to protect natural resources, park facilities, or historic structures," park resource managers were reluctant to pursue this alternative given the likelihood of impacts on natural resources. An impediment to effective management has been technical issues associated with interpreting historical hydrologic data from USGS gauging stations, aerial photos, and bank retreat monitoring efforts.

In 2002 the park received technical assistance from the NPS Water Resources Division and the Geologic Resources Division to evaluate the existing information and recommend a scientifically sound course of action. After two site visits, NPS Hydrologist Rick Inglis and Geomorphologist Hal Pranger concluded that the Taiya River would eventually migrate through and destroy the remaining portions of Dyea if the channel bank is not stabilized. Although protection of the bank is possible using conventional methods, the geoscientists recommended that the park consider engineered logjams, a new ecologically sensitive approach. In-stream structures of interlocking, native wood debris, engineered logjams are designed to imitate natural logjams and stream processes to achieve physical and ecological objectives including aquatic habitat restoration, flood control, and bank protection.

The park is exploring the feasibility of constructing engineered logjams to protect at-risk resources in the Taiya River floodplain. Information gained from the Water and Geologic Resources Divisions will likewise assist managers in locating potential sites for park facilities that may be developed in the future. Park resource managers are coordinating with other landowners along the river to meet human needs in the watershed without compromising the outstanding natural resources of the ever-changing Taiya River system. ■

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NPS PHOTO

The National Park Service has relocated the McDermott cabin, thought to be a toll station for gold rush stampeders crossing the Taiya River to reach the start of the Chilkoot Trail. The Park Service is also studying the possibility of an ecologically sound way to stabilize the riverbank to protect the park's cultural and natural resources.

Reducing the impacts caused by U.S. Army Corps of Engineers activities in coastal national parks

by Julia Brunner and Rebecca Beavers

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Altered by filling and building seaward of the natural beach, the shoreline of Ocean Beach in Golden Gate National Recreation Area is eroding. The Army Corps of Engineers, City of San Francisco, and National Park Service recognize the origin of the problem and are coordinating a solution to protect vulnerable infrastructure and preserve coastal processes and recreational park values such as surfing.

THE U.S. ARMY CORPS OF ENGINEERS (THE CORPS) builds and operates hundreds of flood control, environmental protection, and other civil works in and adjacent to units of the National Park System. Totaling millions of dollars, these projects include dredging of navigation channels, disposal of dredged sediments, replenishment of beach sand, construction of structures such as riprap and jetties, and, increasingly, "ecosystem restoration."

Some of these projects are completed upon a national park's request to benefit park resources. For example, the Corps is using a combined approach of riprap, sills, and constructed wetlands along selected segments of 17 miles of Jamestown Island's shoreline to stop riverbank erosion and protect archeological resources at Colonial National Historic Park, Virginia. Similarly, the Corps has replenished the beach within Gulf Islands National Seashore, Mississippi, to protect cultural resources at Fort Massachusetts. At Jean Lafitte National Historical Park and Preserve, Louisiana, the Corps is helping the park to protect thousands of acres of globally rare, floating estuarine marshes from erosion.

Formerly, some Corps projects have resulted in adverse effects on national parks. Previously at Cape Hatteras National Seashore (North Carolina), for example, the Corps deposited dredged material beyond the littoral (sediment) system, which hastened beach erosion and affected visitor enjoyment, infrastructure, and cultural resources. Additional erosion problems attributed to Corps-constructed jetties have occurred at Padre Island (Texas) and Assateague Island (Maryland) National Seashores.

Concerned about these impacts, several national parks are taking a proactive, two-pronged approach with the Corps. First, instead of simply reviewing documents detailing Corps project proposals in parks, five parks in 2002 sought (and three obtained) "cooperating agency" participation in the planning process in order to elevate concerns about preserving park resources. Second, these parks also require that Corps activities within park boundaries be conducted with NPS permission, typically a special use permit. These national parks are not attempting to hinder the Corps's mission; instead they are allowing Corps activities in parks to proceed subject to the terms and conditions necessary for protecting park resources, values, and visitor safety.

The results of this new relationship are positive. Fire Island National Seashore (New York), for example, as a cooperating agency helped the Corps recognize the value of using natural dune restoration in its Storm Damage Reduction Environmental Impact Statement. At Jean Lafitte's Barataria Preserve unit, Louisiana, the Corps agreed to abandon plans for bankside disposal of dredge spoil from a channel maintenance project, and will instead pump the material into a park-designated area, restoring 50 acres of marsh lost to erosion. On the other flank of the Barataria Preserve, where the Corps is constructing a hurricane protection levee for the suburbs of New Orleans, it redesigned borrow pits to enhance wildlife habitat and minimize impacts to hydrological function and the cultural landscape. Likewise, the input of Cape Hatteras National Seashore, North Carolina, in a Corps dredging project mitigated impacts to a wetland. Gulf Islands National Seashore's input on two dredging and restoration projects may increase the scope of alternatives. Assateague Island National Seashore is collaborating with the Corps to mitigate the impacts of the Ocean City inlet by restoring the natural sediment budget. Based on the response of the first phase of the project to several mild storms, the restoration appears to be performing exactly as planned. Finally, Golden Gate National Recreation Area is working closely with the Corps, the City of San Francisco, and other entities to ensure consideration of park resources and values in plans for protecting vulnerable municipal infrastructure along the eroding shoreline of Ocean Beach.

Like any new strategy, this one will take time to implement effectively throughout the National Park System. Clearly, the new NPS approach is stimulating better Corps project design and implementation and enhancing protection of NPS coastal resources. The Geologic Resources Division can help national parks lacking staff or expertise to adopt this approach elsewhere. ■

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NPS PHOTO

The National Park Service, Army Corps of Engineers, State of New York, and other entities are coordinating a potential beach nourishment project that addresses erosion of Fire Island National Seashore (shown here), adjacent state and county parks, and other public and private property on the barrier island. The national seashore obtained cooperating agency status in the project, and is encouraging the establishment of undulating dunes, areas where surf can safely wash over the island, and the incorporation of stabilizing dunes grasses.

Park soundscapes protected in litigation

by David Jacob

The National Park Service strives to preserve and restore the natural quiet and sounds associated with the physical and biological resources of the national parks. Disturbances are evaluated against the environment of sound that exists in the absence of human-caused noise. In 2002, this policy was addressed in two significant court decisions that involved intrusions on natural "soundscapes" in national parks from aircraft.

The first, *Grand Canyon Trust v. Federal Aviation Administration*, dealt with the proposed replacement of an airport in St. George, Utah, with a new one to be located near Zion National Park. The U.S. Court of Appeals, District of Columbia Circuit, ruled that the Federal Aviation Administration (FAA) did not adequately address the cumulative effects of the new airport in the environmental assessment and therefore failed to satisfy the National Environmental Policy Act. The court held that rather than analyzing only the increase in noise from the new airport over the existing one, the environmental assessment should have considered the total noise impact of the replacement airport on the park, including noise from other regional airports and human activities.

The second case, *U.S. Air Tour Association v. FAA*, involved overflights of Grand Canyon National Park. Pursuant to the Overflights Act, the National Park Service defined the term "substantial restoration of the natural quiet" as requiring that 50% of a park experience natural quiet for 75% of the day. The National Park Service interpreted "the day" to mean a 12-hour daylight period in which this threshold was not to be exceeded; the FAA interpreted it to mean an average annual day, or the amount of noise per day averaged over an entire year. The same court as presided in the Grand Canyon Trust case remanded the issue to the FAA for further consideration, noting that the FAA's interpretation appeared inconsistent with the NPS definition of the term and the underlying premise that aircraft should be regulated to enhance the experience of park visitors. The court also remanded the FAA's methodology for projecting impacts because it excluded noise from aircraft other than park air tour aircraft. ■

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Ensuring acceptable risk for Mojave National Preserve springs

by Chuck Pettee

NPS PHOTO BY ANNIE KEARNS

Unnamed spring, Providence Mountains, Mojave National Preserve, California.

After months of negotiation, an agreement was reached in 2002 between the U.S. Department of the Interior and Metropolitan Water District of Southern California to protect spring flows at Mojave National Preserve. At issue was the water district's proposed Cadiz Ground Water Storage and Dry Year Supply Project for a desert basin near Mojave National Preserve.

The project would divert surplus Colorado River water and store it underground. During dry years both the stored water and groundwater would be withdrawn and sent to users in southern California. Groundwater withdrawals introduce the potential of altering flows at the preserve's springs. The Department of the Interior's approval of a right-of-way permit for the project hinged in part on preventing such impacts.

AWARD-WINNER PROFILE

Using science to bring life back to the Everglades

NPS PHOTO

Bison statuette, awarded to winners of the Director's Awards for Natural Resource Stewardship.

Dr. Robert "Bob" Johnson was honored in 2002 with the Director's Award for Natural Resource Stewardship. For 12 years Bob has been instrumental in protecting and restoring the resources at Everglades National Park. His leadership has proved invaluable and his persistence worthwhile. Bob's approach to problem solving using a science-based decision-making process aided in his success.

Once home to a free-flowing river that provided clean water from Lake Okeechobee to Florida Bay, the Everglades has been in decline for a half century. A booming population, coupled with the agriculture industry, has altered natural water flow patterns and water quality, affecting birds, other wildlife, and vegetation, and has driven the natural environment to near collapse. The Comprehensive Everglades Restoration Project is a plan to restore the Everglades and is the largest and most complicated environmental project in the world. It calls for a series of ecologically sensitive improvements to water control systems, which will take place over more than 20 years. This project was authorized by the Water Resources Development Act of 2000, and the National Park Service helped in its creation.

Bob has been involved since the beginning, guiding the project by obtaining the necessary funding and personnel. He was responsible for coordinating the technical and scientific input of NPS resource staff from the south Florida parks and for the development of simulation models for ecological and hydrological responses. He also helped to bring the science of Everglades restoration to multiple forums, including Native American tribes; state, local, and federal agencies; and nongovernmental organizations.

Overall, Bob's achievements illustrate how science is essential in ecological restoration and protection. He is an indispensable leader of the Comprehensive Everglades Restoration Project, which, if successful, will be a model for wetland restoration projects worldwide. ■

After months of data analysis, the technical experts could not resolve differing opinions about the potential for impact. The stalemate was broken when the water district accepted the risk associated with the technical uncertainty and committed to operate the project to prevent interference with spring flows. The water district would get less water than planned if its assumptions were wrong. A Ground Water Monitoring and Management Plan was developed to ensure that protecting spring flow was undertaken in a cost-effective and technically adequate manner. The plan requires that pumping be monitored by a network of wells and that the monitoring system be managed to adapt to changing data needs. The intent is to develop models for forecasting the effects of pumping so that mitigation occurs early enough to prevent future changes in spring flows. This is necessary because spring flow changes may not occur for decades after pumping, when it is too late for mitigation. ■

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NPS PHOTO BY BRUCE BADZIK

Anacapa Island restoration continues

by Carol DiSalvo

Black rats *(Rattus rattus)*, an exotic species introduced to the California Channel Islands before 1940, were a serious threat to the islands' native species. The rats preyed on reptiles, amphibians, marine and terrestrial invertebrates, and the young and eggs of island-nesting seabirds. On Anacapa Island, part of Channel Islands National Park, these ravenous predators prevented two rare bird species, the Xantus's murrelet *(Synthliboramphus hypoleucus)* and ashy storm-petrel *(Oceanodroma homochroa)*, from nesting successfully.

The Anacapa Island Restoration Project is the effort of the National Park Service in conjunction with a partner, Island Conservation and Ecology Group, to restore the island's habitat for native species. In November 2002 the second phase of the project got under way with the application by helicopter of the rodenticide brodifacoum on middle and west Anacapa islets; the treatment was modeled on the successful baiting of rats on east Anacapa Island in 2001. The project was developed with public and environmental input through NEPA (National Environmental Policy Act), a planning process that evaluated several management options. As part of the process, the National Park Service applied for and received an exemption from the Environmental Protection Agency permitting use of the rodenticide on the park's natural areas.

Concern about the possible inadvertent poisoning of migratory birds, birds of prey, and native rodents prompted the National Park Service to implement a number of risk-reduction strategies. The project was designed around a specific biological window, November through December, when bird activity is low and the rats are more willing to accept the bait because other food sources are less available. The National Park Service also live-trapped native mice and birds of prey before applying the rodenticide; these animals were released after the threat of poisoning passed. A deflector attached to the bait hopper (arrow in photo) increased precision of the bait application on the steep hillsides of the island. Project staff conducted intensive search and removal of rat carcasses for 13 days after the baiting, followed by less intensive searches. Bird and wildlife populations were also extensively monitored before and after the bait application to assess efficacy and any unwanted impacts of the treatment.

Monitoring indicates that east Anacapa Island apparently is free of black rats a year after treatment. Researchers found an intact Xantus's murrelet egg, which was notable because rat depredation of eggs had been repeatedly recorded in the past. Survival of juvenile lizards and salamanders on rat-free east Anacapa was double that on middle Anacapa. More than 150 native deer mice released on east Anacapa are breeding and their numbers had increased to approximately 1,000 by the end of the breeding season. Although years of monitoring will be required to determine if black rats have been eradicated on Anacapa Island, the project is already helping native species rebound from the crippling impacts of this voracious exotic species. ■

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Air quality improving in many parks

by Dee Morse

The National Park Service's August 2002 report, "Air Quality in the National Parks—Second Edition," summarizes the results of 10 years of air quality monitoring activities in 32 national parks. According to the report, air quality is improving or remaining stable in more than half of the parks monitored, but restoring clean air to parks will require continuing efforts.

From 1990 to 1999, 28 parks were monitored for visibility. The report indicates that 22 of those parks showed improving visibility conditions. Acid rain monitoring to determine levels of sulfates and nitrates was conducted in 29 parks. Twenty-five parks showed a decrease in sulfate levels, while 14 showed a decrease in nitrate levels. Fourteen parks had lower levels of both sulfates and nitrates. Ground-level ozone concentrations were monitored at 32 parks. Results indicate that ozone levels improved in eight parks, but deteriorated in 16 parks.

More than 60 units in the National Park System are currently conducting monitoring activities to provide information on ozone levels, acid rain, and visibility impairment in parks. Air pollution affects many parks, but air quality monitoring conducted over the past 20 years documents that, in most parks, air quality is better than standards set by the Environmental Protection Agency to protect public health and welfare.

The report is published online at http://www2.nature.nps.gov/ard/pubs/aqnps.htm. ■

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Legend

- Improving trend
- Degrading trend
- No change